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Excess Vacancies and the Nucleation of Precipitates in Aluminum-Silicon Alloys*

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Abstract

The number and distribution of silicon precipitates were examined with the transmission electron microscope in Al-Si alloys after various quenching and pre-aging treatments. The number of precipitates depends on the conditions of heat treatment in a manner very similar to the dependence of the vacancy clusters on the heat treatment conditions in pure aluminum.

The results are satisfactorily explained in terms of vacancy clusters which are formed during pre-aging and act as preferential nucleation sites for silicon precipitates. The mechanism, which assumes small silicon clusters to be formed homogeneously in the matrix during pre-aging and to act as nuclei at subsequent aging, cannot explain the present experimental observations.

The mobility of silicon atoms at near room temperature is also discussed.

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